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# Post-Remedial Use of Superfund Sites
# Social and Economic Effects of Remediation

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3101 POST-REMEDIAL USE OF SUPERFUND SITES: SOCIAL AND ECONOMIC EFFECTS OF REMEDIATION

This report is part of the National Network for Environmental Management Studies under the auspices of the Office of Cooperative Environmental Management of the U. S. Environmental Protection Agency. The purpose of the report is to study the social and economic issues involved in cleaning up Superfund sites.

EPA usually avoids making land use an explicit consideration when the Agency chooses a cleanup strategy. Yet post-remediation land use assumptions are part of the risk assessment calculation used in determining cleanup levels of Superfund sites. Evasion of significant issues, including use of the site after EPA and the state completes work, only frustrates a community's efforts to understand and cope with a hazardous waste site. A community's perceptions of how a site affects them - including economic effects, health problems, and a range of social and psychological issues - will inevitably affect use of the site affect after remediation are completed.

Land use issues seem most controversial where great pressure exists for residential development near Superfund sites. Re-use of a contaminated site is usually more acceptable in industrial zones and undeveloped areas. In all areas, post-remediation use of sites will be shaped by public perceptions of the property and its effect on the commonwealth. Use of the formerly contaminated site, particularly for residential or public use, may depend on overcoming the taboo which forms during the process of site discovery, investigation, and many technical studies. A maximum of community involvement in the process could minimize many problems.

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# Post-Remedial Use of Superfund Sites

## Social and Economic Effects of Remediation

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Boston, August 1988

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## Executive Summary

EPA usually avoids making land use an explicit consideration when the agency chooses a cleanup strategy. Yet post-remediation land use assumptions are part of the risk assessment calculations used in determining cleanup levels of Superfund sites. Evasion of significant issues, including use of the site after EPA and the state completes work, only frustrates a community's efforts to understand and cope with a hazardous waste site. A community's perceptions of how a site affects them--including economic effects, health problems, and a range of social and psychological issues--will inevitably affect use of the site after remediation efforts are completed.

Land use issues seem most controversial where great pressure exists for residential developments near Superfund sites. Communities appear to be less tolerant of containing toxics on a site in residential or developing areas than they are of containment in an industrial zone. Re-use of a contaminated site is usually more acceptable in an industrial zone than in residential areas. Post-remediation use of Superfund sites also does not seem as sensitive an issue in undeveloped areas as in developing residential communities, though groundwater contamination is a special concern. In all areas, post-remediation use of Superfund sites will be shaped by public perceptions of the property and its effects on the commonweal.

Use of a formerly contaminated site, particularly for residential or public use, may depend on overcoming the taboo which forms during the process of site discovery, investigation, and many technical studies. A maximum of community involvement in the process could minimize many problems. EPA should therefore institute citizens' advisory committees to decide how Superfund sites will be used after the remediation work is completed. EPA should seek to meet a town's desire for detailed land use restrictions, particularly if the Agency mentions a specific land use in connection with the remediation strategy. Finally, EPA should carefully track the use of sites after the Agency completes remediation work.

## Acronyms

CAC- Citizens Advisory Committee
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act (Superfund)
DCE - Dichloroethane
DEQE - Massachusetts Department of Environmental Quality Engineering
EPA - United States Environmental Protection Agency
NCP - National Contingency Plan
NNEPS - National Network for Environmental Policy Studies
NPL - National Priority List
PCB - Polychlorinated Biphenyls
PCE - Tetrachloroethylene
PRPs - Potentially Responsible Parties
RCRA - Resource Conservation and Recovery Act
RI/FS - Remedial Investigation and Feasibility Study
ROD- Record of Decision
SARA - Superfund Amendments and Reauthorization Act of 1986
TCE - Trichloroethylene
VOCs - Volatile Organic Compounds

## *Foreword*

This study was produced under the auspices of the National Network of Environmental Policy Studies (NNEPS), a project of the United States Environmental Protection Agency (EPA). The writer, a graduate student in Urban and Environmental Policy at Tufts University, Massachusetts, was awarded an NNEPS fellowship for summer 1988 to study the social and economic issues involved in cleaning up Superfund sites to various levels. EPA Region II staff, which proposed the project for the NNEPS program, asked for an overview of the generic social and economic issues encountered when considering post-remedial land use of Superfund sites cleaned up to various levels.

Direct discussion of land use issues has been avoided when Superfund has been considered by Congress, shaped by EPA regulations, and examined for details of site cleanups. Yet risk analysis is based on the level of human exposure to toxics, which--particularly in the case of contaminated soil--is dependent upon how the site will be used. People will spend far less time at conservation land or at a landfill than at a school or home, and therefore the level of human exposure would be far greater at the last two uses. Residents near contaminated sites, and interest groups favoring reduction of toxic hazards, however, fear that potentially responsible parties (PRPs) and government regulators would use post-remediation land use as an excuse for half-measures and partial cleanups. Yet the same residents who fiercely seek the expensive destruction of all wastes on a site may still avoid the use of that site after the work is completed and the site is opened for private or public development.

The complicated tangle of community perceptions of Superfund sites and post-remediation land use issues has never been studied. This is not only because of the intense political issues involved, but also because few Superfund sites have been declared clean and opened for reuse. This study therefore depends upon information from CERCLA/SARA regulations, previous studies of socio-economic issues identified with Superfund sites, public concerns recorded in Superfund site cleanup plans (Records of

Decisions, or RODs)[1], and comments solicited from citizen activists and local officials.

## Acknowledgements

If Douglas Newman had not pushed for the establishment of the National Network for Environmental Policy Studies in EPA, this report would not exist. I wish to thank Peter Moss, P.E., of EPA Region II, for selecting me to do the study, giving me a large degree of creative independence, and providing editorial support. Professors Ken Geiser and Sheldon Krimsky, with the Center for Public Service at Tufts University, not only helped guide this project but also my education at Tufts. EPA Region I employees were very helpful; in particular Dennis Heubner gave me access to Agency resources. People at EPA headquarters, particularly David Levy, Bill Hanson, Melissa Shapiro, Todd Gold, and Thomas Pheiffer, guided me to relevant studies and provided important information. Activists and public officials in Coventry, RI, Edison Township, NJ, Wall Township, NJ., North Dartmouth, MA, Aurora, CO, and southern New Hampshire, shared their perceptions of land use issues and EPA's efforts at nearby Superfund sites. Vance Hughes, formerly with ICF, and Mary Ellen Schlotz, in ICF's Boston office, were very helpful. Barbara Smith-Mandell, my wife and a professional technical editor, not only provided moral and financial support during my studies, but also measurably improved this report.

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[1] A study of Superfund by the Congressional Office of Technology Assessment notes that by looking at RODs, "the functioning Superfund comes into focus because everything that was done before the ROD must be considered and everything to come later must be anticipated." U.S. Congress, Office of Technology Assessment, "Are We Cleaning Up? 10 Superfund Case Studies--Special Report," OTA-ITE-362 (Washington, D.C.: U.S. Government Printing Office, June 1988), p. 2

# I

## *Formatting Hazardous Waste Cleanups*

In 1979 Congress, reacting to the Love Canal crisis and a growing sense of the problems caused by hazardous waste dumps, created the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as Superfund. EPA began Superfund work under Rita Lavelle in 1980 and almost immediately became mired in controversy. EPA officials were accused of making deals with polluters, using Superfund as a political tool, delaying cleanup efforts, and moving contaminants around the country instead of seeking permanent destruction. In this political atmosphere, Congress in 1986 revamped CERCLA by passing the Superfund Amendments and Reauthorization Act (SARA). SARA caused many changes in the Superfund program. It specifically directed EPA to favor cleanups that permanently reduced the volume, toxicity, or mobility of hazardous waste as a principal element. The law placed off-site landfilling without treatment at the bottom of the list of potential remedies, codified public involvement in the program (including technical assistance grants), and included more stringent state environmental laws among the regulations EPA had to meet. The creators of SARA wanted EPA to gain the trust of residents and officials near Superfund sites. The preference given permanent cleanups and public participation would, it was hoped, increase trust in the Agency and in Superfund activities.

CERCLA has been implemented by EPA's regulations contained in the National Contingency Plan (NCP). The last NCP was published before SARA. A new NCP is being prepared. A draft of the new NCP (February 1988) emphasizes the site-specific nature of cleanup activities and levels. This might invite examination of land use questions when EPA investigates a site and picks a cleanup level. Cleanup target levels of most pollutants could conceivably be left higher at a site traditionally surrounded by heavy industry than at a site surrounded by houses and zoned residential. Yet, although one EPA official admitted that allowing higher contaminant levels for industrial

areas has been discussed, EPA has avoided the explicit study of land use issues in Superfund.[1]

Only the highly technical risk-assessment part of the remedial investigation allows the consideration of potential site uses to enter the Superfund decision-making process. Preliminary cleanup levels established during the remedial investigation "are based on acceptable levels of exposure" at the site after clean-up is completed.[2] Potential exposure factors are based on the number of hours humans are exposed to any toxics left on the site; exposure-hours are dependent upon the use of the site. Unfortunately, the post-remediation land-use assumption, upon which the risk-asssessment of a particular site is based, is rarely put in the ROD. The vague language in the draft NCP may reinforce a desire to avoid the

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[1]Interview with Bill Hanson, head of EPA's Site Policy and Guidance Branch, Hazardous Site Control Division, 5/25/88 and 9/23/88; interview with Charlotte White, EPA Enforcement Office of Superfund, 6/10/88. When I asked one region's community relations section to name sites where land-use issues are or had been significant, my request was considered so sensitive that it was sent up to the region's legal counselor and the division's deputy director.

[2]EPA defines acceptable levels of exposure to carcinogens as "levels that translate into an upperbound excess lifetime risk to an individual of between 10-4 to 10-7"; i.e., one case of cancer in 10,000 to one case in 10,000,000. The draft NCP notes that EPA begins its risk level selection at 10-6, but can pick a different level within that range when the following site-specific issues are considered: "exposure factors (e.g., the cumulative effect of multiple contaminants, the use of the resource, the impacts on environmental receptors,)," and "uncertainty factors (e.g., the reliability of non-engineered controls and the reliability of alternatives) [non-engineered controls are defined as institutional and legal controls on future use of the site], implementability and technical factors (e.g., limitations on restoration, background levels.)." U.S., Environmental ProtectionAgency, 40 CFR Part 300, "Draft National Oil and Hazardous Substances Pollution Contingency Plan," 12 February 1988, p.128 (emphasis added).

discussion of potential land-use.[1] The connection between land-use assumptions and any part of the decision-making process needs to be an explicit part of the ROD.

The most forthright statement of how land use assumptions drive a Superfund site risk assessment can be found in the Brio Refining ROD. The site is a former petrochemical refining plant near Houston, Texas. Several subdivisions, a junior college, an elementary school, and a hospital are located within a half-mile of Brio. In 1985, nearly 6,000 people lived within one mile of the site; 71,000 resided within four miles . "Using a trespass exposure scenario, which assumed that the site would remain a secured industrial facility, target removal and treatment levels for selected chemicals were developed. The endangerment assessment also examined an unrestricted access exposure scenario which indicated that greater volumes of affected materials and soil would have to be treated [than the recommended remediation] should exposure to the site increase."[2] The Brio ROD included permanent site controls --deed notices and restrictions--seemingly (though this was not specified) to enforce the projected industrial use.

EPA has been criticized for using a site-specific risk assessment process to determine cleanup goals, instead of using standards found in other federal and state regulations. A recent study by a coalition of environmental organizations found inconsistent exposure assumptions and cited an internal EPA report which called Superfund risk assessments "inadequate, unscientific documents".[3] The technical nature of risk assessment is also seen as

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[1]A subsequent draft has asked for a "maximum reasonable use scenario" as part of the risk assessment study. (Interview with Bill Hanson, 23 September 1988.) This language should encourage discussion of land-use assumptions in the ROD.

[2]Brio Refining ROD, p. 25.

[3]Environmental Defense Fund, et al, "Right Train, Wrong Track: Failed Leadership in the Superfund Cleanup Program," June 20, 1988, pp. 51-52. Citation is of study by Office of Policy, Planning and Evaluation, U.S. EPA, "Evaluation of the Preparation of Risk Assessments for Enforcement Activities," September 1984.

cloaking certain assumptions of exposure and toxicity from public scrutiny.[1] Since post-remediation land use appears to be one of these assumptions, EPA should show in the ROD the land use which forms the basis for the risk assessment of a site. This information is very important to anyone interested in the Agency's actions.

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[1]Testimony of A. Blakeman Early, Sierra Club Washington Representative, on Analysis of Recent EPA Cleanup Decisions, before the Oversight Investigation Subcommttee, House Commmittee on Energy and Commerce, June 20, 1988, p. 5. "Right Train," pp. 51-52, harshly criticizes the risk assessments done by PRPs, noting that PRPs have "an obvious incentive to minimize the nature and extent of risk posed by these sites". Early also told Congress that risk assessments done by PRPs are "inherently unreliable". Moody and Geiser, in their Woburn report (infra), noted the conflict that arises between PRPs and a commuity when site cleanup is considered. "There exists a tension between two clearly stated goals of CERCLA; cleaning up a superfund site and recovering the total costs of clean up from the responsible parties."(p. 9)

## II

## *Effects of Toxic Contamination Upon Surrounding Communities*

The American dream: A four-bedroom ranch house on an acre of green-polished lush lawn, children playing in the quiet street. Without warning, strange sounds and stinks haunt the innocent inhabitants. After trying to endure the horrible mysteries, they bring in an expert who locates the source of the terror: the land under the house. The family flees the doomed home as the very ground erupts and devours their dream. This *Poltergeist*-like scene is the nightmare of many community members concerned about a nearby hazardous waste site.

A community's perceptions of how a site affects them will inevitably affect redevelopment of the site after remediation efforts are completed. Superfund sites in densely populated areas, or where development pressures exist, are particularly prone to controversy and public fear. A study by ICF found that communities are more likely to be concerned if sites appear to threaten the health of families, if hazardous waste problems are endemic in the area, or if homeowners or businesses face economic losses. Community interest generally peaks when the remedial action decision is made. Poor communications or other problems, however, can create a hostile or defensive atmosphere among all parties throughout the process.[1]

In the early years of Superfund, EPA hoped to pinpoint generic community concerns in order to streamline the program. The Agency therefore studied twenty-five sites, but found no relationship between the technical adequacy of response and public acceptance of EPA's decision, or between the extent of site contamination and public involvement. The study found no concerns common to the sites. EPA therefore decided to design site-specific community relations efforts for Superfund sites.[2]

There have been no comprehensive studies of the sociological or psychological effects of a contaminated site upon the surrounding

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[1]ICF, Inc., "Community Relations in Superfund: A Handbook," prepared for the Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, January 1986, pp. 3-9.

[2]Interview with Melissa Shapiro, EPA Superfund Community Relations, 24 May 1988.

community. A few case studies supplement news coverage of certain controversial sites, particularly Love Canal, NY, which provided the primary impetus for the Superfund program, Lipari Landfill, NJ, the site officially ranked the worst in the country by EPA[1], and Woburn, MA, which gave rise to a landmark hazardous waste liability lawsuit[2]. These focus on the politics and decision-making problems, that engendered particular controversies

One of the best of these studies is a recent review of the Nyanza site in Ashland, Massachusetts. The transformation of Nyanza "from a place to work (even if a source of nuisance odors) to a potentially life-threatening menace was a major reversal in perceptions and definitions of reality." Rather than focusing on the meaning of this transformation, Krimsky and Plough moved on to look at how private interests sought solutions different from those of public agencies, how intergovernmental relations affected communications with Ashland residents, and how efforts to deal with health issues generated discontent.[3]

Krimsky and Plough found that most residents were primarily concerned not about details of on-site remediation work, but about the effects of the waste site upon their health. These concerns came to the forefront after a church group found abnormally high rates of cancer near the site. Public fear was not relieved by the cautious assurances of "no immediate threat" contained in government studies. The "rational-analytical" approach to risk analysis, which is inevitably hedged with intricate theories and uncertainties, did not satisfy residents, who instead sought information about actual and potential ailments. Krimsky and Plough therefore recommend providing

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[1]Carl E. Van Horn and Yvonne Chilik, "How Clean is Clean? A Case Study of the Nation's No. 1 Superfund Toxic Dump," Environmental Impact Assessment Review (1988): 1-16; Susan Q. Stranahan, "Broken Promises," 73 Sierra (No. 3, May/June 1988):52-56.

[2]Renee Loth, "Woburn, Science, and the Law," Boston Globe Magazine, February 9, 1986, pp. 14-17, 47-57; Michael Knight, "Pollution is an Old Neighbor in Massachusetts Town," New York Times, May 16, 1980; Katie Moody and Ken Geiser, "Woburn: The Case of the Burdened Water," pilot study, Tufts University Department of Urban and Environmental Policy, October 1986.

[3]Sheldon Krimsky and Alonzo Plough, "Risk Communication for a Hazardous Waste Site: The Case of Nyanza," February 1988 (in press).

affected communities with medical help designed to deal with possible health effects on individuals, rather than conducting technical studies of toxic linkages and exposure rates.

Issues of decision-making and community control lay beneath the controversies about the selection of cleanup remedies and health studies. Local interests had no real bargaining power, and even the town government had no formal role in the Superfund process. An inevitable split, between local residents and town officials who feared losing federal funding to "more cooperative" Superfund communities and permanently harming the town's image, further diluted local power.[1] The townspeople found that only public hell-raising appeared effective. After considerable controversy, in August 1985, DEQE helped set up a citizens' advisory committee (CAC) in Ashland. The CAC was created to organize divergent local interests, formulate community objectives, and improve communications between Ashland and the state and federal agencies. EPA policy provided no role for a CAC, but EPA's site manager found the meetings increasingly useful. A pilot mediation project brought together the CAC, EPA, and DEQE to create clear guidelines for communication through the CAC. Conflicts were not eliminated, but "were no longer caused by a lack of understanding of decision procedures or a lack of structured access to decision information. As a result, the level of frustration and emotion surrounding risk communication has dropped considerably since the summer of 1985."[2]

The essence of Krimsky and Plough's study of Nyanza is that effective communication and the fulfillment of public health needs are more significant to the community than the situation at the site and EPA's cleanup strategy. Communication is vital, not only for EPA's decision-making process, but also for any use of the site by the community after EPA completes its work. As EPA's Community Relations Handbook notes, "Whereas there may have been a hostile or defensive atmosphere early in the cleanup process, citizens and their leaders should be helped to find creative ways to live with the site in their community. For example, as the site is being

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[1] Another community interest group is usually formed by employees of the polluting company or others with an economic stake in the status quo. Nyanza had already ceased operations, so this was not an issue in Ashland.

[2] Krimsky and Plough, "Nyanza," pp. 66-69.

restored to a relatively uncontaminated state, it may be beneficial for citizens to assess the site's potential for commercial and industrial reuse."[1]

The problems caused by a contaminated site, however, go beyond problems of decision-making and physical health. .Public fear is sometimes much greater than the actual health and economic effects of the toxics seem to justify. Efforts to help communities and families affected by contaminated sites must not only consider maintaining good communication and preventing physical health risks, but also the psychological effects of "hosting" a Superfund site.[2]

The primary health issue for residents is usually not the present danger, but the great uncertainty of the future. The Woburn court case shows how medical experts disagree on the precise effects of toxics on individuals.[3] Even worse, the most severe effects--birth defects, immune deficiencies, and cancer[4]--are the most feared of all medical problems because they are the most difficult to diagnose and cure. In addition, the fear that parents or children will become sick or even die from an unknown, uncontrolled, or unacknowledged toxic "time bomb" is only worsened by the uncertain costs of these potential health problems. Fear of the unknown is often manifest when neighborhood activists demand health studies to prove the unprovable. Unfortunately, "health studies may be an important tactic in advancing dump site clean up, but, just as likely, health studies may just delay and stand in the way of more aggressive remedial action efforts."[5]

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[1]"Community Relations in Superfund," p. 4-10

[2]Krimsky and Plough mentioned the "major reversal" of normality that occurred in Nyanza, but then concentrated on communication issues. "Nyanza," pp. 1-3.

[3]Evan T. Barr, "Poisoned Well," The New Republic (March 17, 1986):18-20; Marnie Samuelson, "Learning from Woburn; Statistical Truth and Toxic Waste," Boston Phoenix, May 15, 1984;

[4]"No risk, it seems, it more dreaded in the public mind than cancer." Krimsky and Plough, p. 40. The AIDS epidemic is also elevating public concern about the body's immune system, which may be even more affected by man-made chemicals than is cancer.

[5]Moody and Geiser, "Woburn," Part II, pp. 5-6.

An individual's uncertainty and fear is exacerbated by involuntary exposure to toxics. These feelings are common to residents of industrialized countries confronted with contaminated land. As one English investigator put it, families and communities "are exposed to risks without benefits, without freedom of choice...[they] suffer from a great sense of insecurity...isolation, depression, and helplessness. Uncertainties may remain even once the 'incident' has been dealt with. Feelings of isolation may be increased when authorities and experts claim that the situation is not immediately dangerous and that technical solutions are available in the long run." Groups with different interests, such as affected families, local officials, and workers at the offending industry, may clash, further disrupting the community and injuring individuals.[1]

Toxic contamination not only threatens the physical, economic, and sociological health of an individual, but also endangers cherished American cultural institutions. The American home, and all it represents, is particularly vulnerable. "Toxic contamination represents both an invasion and an inversion of home, and consequently the individual's sense of security and well being is multiply threatened...Toxic contamination in residential areas poses a threat to the assumptions people have about themselves and about the way life is supposed to be."[2]

The home represents the primary monument to America's work ethic, embodying personal independence, and, because of the capital investment in a house, financial and social mobility. Toxic contamination therefore affects many social norms, and threatens far more than an individual's health. The home is also associated with family. Local citizen groups organized to deal with toxic issues therefore often feature various symbols of home and family:

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[1]M.A. Smith, "An International Study on Social Aspects etc. of Contaminated Land," 1:.416-17, in Contaminated Soil '88: Second International TNO/BMFT Conference on Contaminated Soil, 11-15 April 1988, Hamburg, Federal Republic of Germany, ed. K. Wolfe, W.J. Van Den Brink, and F.J. Colon (Dordrecht, FRG: Kluwer Academic Publishers, 1988), 2 vols.

[2]Janet M. Fitchen, "Toxic Chemicals in Residential Environments: Threats to Cultural Meanings of Home and Homeownership," presented at the Annual Meeting of the American Anthropological Association, Philadelphia, PA, December 7, 1986, p. 15.

mothers, children, churches, etc. Toxic contamination disrupts everyday family activities, interfering with the preparation of food, making bathing difficult, even hampering the ability to offer hospitality--a cup of coffee--to a visitor. Victims describe contamination in terms similar to people who have been robbed or raped. Since people identify strongly with their homes, even if the toxics do not directly threaten health, both house and occupants may be affected.[1]

The commonly bemoaned loss of property values may, in part, represent the strong emotional investments individuals have in their homes. Investigators have attempted to identify changes in land and housing values to calculate losses faced by property owners near toxic waste sites. These studies have foundered in a long list of uncertainties associated with the specific sites chosen and methodologies followed by the investigators.[2] One reviewer of the studies noted that, aside from various technical

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[1]Ibid., pp. 3-5. "Some of our informants mentioned that they felt quarantined as if they had a communicable disease." (p. 7). "Some residents report that even after the toxic contamination problems abate or are cured, they do not expect to ever again feel as safe in their home as they once did." (p,. 5).

[2]Public Interest Economics Foundation, "Benefits of Regulating Hazardous Waste Disposal: Land Values as an Estimator," for US EPA, Economic Analysis Division, 1982 and 1984. These studied neighborhoods around sites in Pleasant Plains, NJ, and Andover, MN, and concluded that loss of real property values.due to hazardous waste sites "was impossible to verify...empirically."(1984, volume 1, p. 26) Despite this finding, the study emphasized that "It is essential to make clear that the failure to identify any effect of proximity to a hazardous waste site on property values does not suggest that the economic cost of hazardous waste sites is small or that, similarly, the benefits of regulating them are not potentially large....the finding of no gradient in real estate prices does not constitute evidence that regulating hazardous waste sites is not of economic value." (1984, volume 2, pp. 15-16)A branch of EPA also submitted a draft edition of "Valuing Changes in Hazardous Waste Risks: A Contingent Valuation Analysis" (2 vols., 700 pgs) in 1984. I could not obtain a copy, and as far as I know it never went past the draft stage.

questions (free and open information, government action, scarce housing data, limited data on cause and effect, and off-setting factors), the perception of risks varies with the amount of control that an individual has over the cause of those risks.[1]

The failure of real-estate value studies suggests that standard cost-benefit calculations cannot be used to examine Superfund actions. First of all, market distortions are inevitably part of a hazardous waste site, since the potential problems remain unknown until a government agency steps in to analyze the site before taking action. Second, the costs and benefits of different remedial actions accrue to different economic entities. Most of the costs of any cleanup are paid by the federal government, farthest from the affected neighborhood, whereas the benefits accrue primarily to the affected neighbors. Generally, more expensive cleanup actions bring greater benefits to the neighborhood. Less complete destruction of toxics, on the other hand, saves federal funds but increases the neighborhood's costs.

Other involved parties confuse the issue, particularly the state, which is responsible for 10% of the remedial costs plus any long-term operation and maintenance, and the PRPs, which may be forced to pay for much of the cleanup costs, and may try to reduce costs by offering a less complete and less expensive cleanup option to the federal government. In addition, the costs faced by a contaminated community are largely hidden, whereas the benefits of complete cleanup are both more quantifiable and very large. Economic inquiry highlights the importance of social, psychological, and cultural issues in the Superfund program. Post-remediation use of Superfund sites must face these same issues.

In their study of Nyanza, Krimsky and Plough pointed out the importance of good communication between responsible agencies and the affected populace. Public participation appears to overcome many of the psychological problems associated with Superfund sites. Isolation, depression, and helplessness "may be alleviate by collective action by the community affected...A community may gain greater coherence as citizens

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[1]Temple, Barker & Sloane, Inc., "Methodology Review for RCRA Benefits Analyses," US EPA, Office of Solid Waste, Economic Analysis Branch, June 1985, pp. IV - 5-7.

band together in the face of adversity."[1] Redevelopment of a formerly contaminated site, particularly for residential or public use, depends on overcoming the taboo that forms from problems associated with the site. A citizens' advisory committee should therefore not simply coordinate community information, but should--as a decision-making body on par with the state--help select cleanup actions.[2] The CAC should also have a lead role in deciding how the Superfund site will be used after remediation work is completed. The sense of helplessness and violation which many victims report even after a contamination problem has abated, can perhaps be best counteracted by empowering the residents most affected by a Superfund site.

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[1]Smith, "Contaminated Land," pp. 417 and 419.

[2]"The arguments against formal citizen participation in the decision making process usually state that the process would be delayed and decisions may be less sound due to their lack of technical expertise on the issues. In fact, nothing could have delayed the clean up process of two Superfund sites in Woburn more than the inherent weaknesses of CERCLA, and usually exclusion of citizen participation results in extensive delays because they are put in a position of having to react to decisions." Moody and Geiser, "Woburn," p. 11.

## III

## *Post-Remediation Land Use Issues*

At this time, few cleanups have advanced to the point where sites have been eliminated from the NPL.[1] This makes studying post-remediation land uses a matter of speculation. EPA does not seem to be monitoring the few decontaminated sites. It is difficult even to obtain names and locations. One individual, not in EPA, told me that a site in Athens, GA, which had been cleaned of radium, had been purchased by a person who turned around and re-sold it , "and it is probably a fast-food stand now." [2]

Since few sites have been cleaned up, this study focuses on citizen and Agency concerns about the potential use of contaminated land. RODs show the past and current use of land on and near each site. Community Relations Plans include either a summary or listing of community and PRP concerns about EPA's RI/FS; these concerns often expose current and potential land use issues. Because the Superfund program changed significantly since Congress passed SARA, most of the data in this study came from RODs signed after 1986. Important information also came from citizen activists, local officials, and various EPA officials. Land uses, for both the site and surrounding areas, fell into three categories: residential, industrial, or undeveloped.[3]. Since EPA after SARA mandated cancer risks of between $10^{-4}$ and $10^{-7}$, comparing cleanup levels means an examination of methodologies: destruction of toxics, solidification/fixation, on-site landfill, or removal off-site. This information should show whether nearby residents

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[1]EPA has eliminated the following sites from the NPL after cleanup work: Gratiot County, MI; Freedman Property, NJ; Enterprise Avenue, Philadelphia, PA; Lehigh Electric Company, PA; Chem Metals, Baltimore, MD; Kapatomo Farms, American Samoa; Luminous Processing, GA; Wolcott Chemicals, MS; Mars Arsenic, MN; Chem Metals, OH; PCB spills in Guam, the Pacific Islands, and along a North Carolina road.

[2]Interview with Vance Hughes, 8 June 1988. Mr. Hughes worked for several years with Clean Sites and ICF on Superfund community relations issues.

[3]These are the land-use categories used by the Massachusetts Contingency Plan, which could be a model for EPA's NCP.

and local officials feel a particular cleanup "level" is insufficient to permit future development of a site, or sufficient to allow some use of all or part of the land. It should also be possible to determine the effects of that cleanup upon surrounding properties.

The reactions of EPA officials and others involved on a professional level with Superfund to the idea of land use being an explicit consideration in toxic cleanups ranged from skepticism to outrage. Sandra Rennie of ICF, who worked on a study for EPA of "Superfund Indicators of Success", stated that ICF had considered "restoration to appropriate use" as one indicator, but ruled it out. Site managers have been reluctant to lower the fences, even when cleanup goals are met. Before listing on the NPL, most sites were dumps, she noted, so would "restoration to appropriate use" mean cleanups should be limited, since the land would regain only that use? "Don't believe for a minute," she told me, "that anyone wants to buy into the liability of purchasing a Superfund site."[1]

At this time there are at least two proposals to put housing and stores on portions of Superfund sites: Tinkham Garage in New Hampshire, and Operating Industries in California. In Massachusetts, land use is considered, but it is not the only factor in cleanup decisions. Potential land use is part of EPA's risk assessment calculations; if EPA maintains risk assessment as the base for cleanup activity, the Agency should describe in the ROD the basis for those calculations. Development pressures, or other potential uses not known to EPA, could change the risks posed by a particular site or by EPA's cleanup goals.[2] The only way to judge this is to address land use issues in the Superfund RI/FS process.

Properties near Superfund sites are dependent upon EPA's cleanup actions. As Sandra Rennie noted, most Superfund sites are former hazardous

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[1]Interview with Sandra Rennie, who has worked with Clean Sites and is now with ICF, 10 June 1988. Two of the sites where development is now a major issue are Tinkham Garage, New Hampshire, and Operating Industries, California.

[2]At a public hearing about the Waldick Aerospace site, someone present told EPA officials about plans for a housing development on part of the site. The officials expressed surprise and promised to look into it. The results of that inquiry were not in the ROD.

waste treatment and storage locations. Nearby residents are horrified by the idea of building houses or stores on former dumps, though the restoration of industrial areas seems to encounter less resistance. The most important land use issue in cleanup efforts may be how remediation will affect the area around the site, particularly when contaminated groundwater moves beyond the site boundaries. Some towns have passed outright bans on development within a set radius of a Superfund site; Coventry, Rhode Island, now faces a lawsuit because it banned building within 1800' of the Picillo Farm site.[1] Post-remediation use of a Superfund site cannot be studied in isolation from neighboring properties, just as the geology, geography, and hydrology of the site cannot be isolated.

## Residential Areas

Few Superfund sites exist in long-standing densely-populated neighborhoods; most are on marginal land in rural towns. Demographic and sociological changes have made many of those areas prospective residential properties. Superfund sites in residential areas are therefore usually found in developing areas within commuting distance of prosperous cities. This is particularly apparent in Region I, where development issues are faced at Tinkham Garage (Londonderry, NH), Picillo Farm (Coventry, RI), Ottati and Goss (Kingston, NH), Re-Solve, Inc. (Dartmouth, MA), and Keefe Environmental Services (Epping, NH). Potential residential land use is also an issue with a site in Middle Township, Cape May County, New Jersey (Region II).

### Ottati and Goss; Kingston, New Hampshire.

Kingston is about an hour's drive north of Boston and less than fifteen minutes from the ocean. This area of New Hampshire is undergoing intense residential development as a result of Boston's booming economy and skyrocketing housing prices. EPA signed the Ottati and Goss ROD in January 1987; the document shows development was a major issue in the RI/FS

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[1] Interview with Coventry town planner, James Finger, 29 June 1988. Other places which have banned development include Cape May County, New Jersey (within one mile of the Williams Property site), and Aurora, Colorado (within one mile of the Lowry Landfill site).

process. The 35-acre site, a former industrial waste storage and drum reconditioning plant, adjoins marshland and a large pond, and is--like the surrounding area--zoned residential. The primary contaminants are PCBs and VOCs (TCE, PCE, 1,2-DCE, and benzene). EPA decided to treat VOC-contaminated soils (14,000 $y^3$) by low temperature thermal stripping (also called aeration) and PCB-contaminated soils and sediments (5,000 $y^3$) by incineration. Decontaminated residuals will be backfilled and covered according to RCRA standards. Contaminated groundwater will be extracted and treated by precipitation/flocculation, air stripping, biological treatment, and ion exchange. EPA planned to decontaminate the site for about $20 million.[1]

In reply to a comment from a PRP that site development was unlikely, and that aquifer cleanup was therefore unnecessary, EPA noted that the site had been zoned rural residential since 1978. The site may therefore be developed for residential use without special permits or for industrial use if approved by both the board of selectmen and the town meeting.[2] This suggests that residential development is more likely than industrial use. PRPs suggested institutional controls, such as deed restrictions and fences, in place of the treatment chosen by EPA, but EPA noted that the feasibility of permanent treatment meant controls did not meet SARA's requirements.

A recent critique of Superfund congratulated EPA for its decision at Ottati and Goss, calling it "treatment to the maximum extent practicable".[3] EPA's actions have not, however, met with total approval, and this may affect future use of the site. Because of a lawsuit certain information is considered confidential and cannot be released to the public; this has angered many residents.[4] Martha Bailey, head of a local citizen organization involved with the cleanup, was angry that the property has yet to be fenced, that "the air monitoring trailer was never hooked up to the monitors," and that EPA's

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[1]Soil decontamination to cost $14,023,000, groundwater decontamination to cost $5,812,500.

[2]Ottati and Goss ROD, p. 94.

[3]"Right Train," p. 39

[4]"At the beginning public info meetings drew 250+, but when the law suit began residents could not get questions answered and had to go elsewhere for information." Martha Bailey's answers to my questionaire, 3 June 1988.

documents fail to define the contaminated groundwater plume. She noted that real estate prices have dropped within a mile of the property. Ms. Bailey feels that the cleanup decision outlined in the ROD leaves the site without a future source of drinkable water, and vows her organization will halt any potential development.[1]

At a public meeting in September 1986, Kingston residents seemed primarily interested in the various cleanup alternatives, the monitoring of private wells, and the alternative water supply proposed by EPA. They asked the Agency if it would advise new home buyers about the groundwater contamination; "the Agency said this was left up to the town and that the buyer should beware." They were concerned that there were no means to stop development on the site.[2] They also worried that new businesses on a nearby highway might increase the demand on an alternate water supply proposed by EPA. The Agency's decision not to provide that supply angered many residents.

EPA noted in the ROD that residents are "concerned about future commercial and residential development of the area."(p. 95) Martha Bailey, wrote that "the site has been for sale since 1980. I have stopped any purchase because there is no drinkable water on site [as] Kingston does not have a municipal water supply. The polluter and owner did not pay their property taxes in 1987 therefore the Town of Kingston now has a lien on this property and can control any future development. WASTE [Bailey's organization] would not allow a school, home, park or shopping center on this property." Town officials, seeking refuge behind the lawsuit and EPA's dominance, express an unwillingness to be involved in land use issues.[3]

**Keefe Environmental Services; Epping, New Hampshire.**

Epping, seven miles northwest of Kingston and along a major highway, also faces development pressures. In 1978 the town granted Paul Keefe a permit to construct a chemical waste storage and treatment facility. Within a year, state and local officials sought to limit or stop operations at the facility because of terrible odors and groundwater contamination. EPA

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[1] Ibid.

[2] U.S., E.P.A., Ottati and Goss Feasibility Study Public Meeting Summary.

[3] Telephone interview with a Kingston, NH town official, 29 June 1988.

became involved when winter storms almost caused a waste lagoon to overflow into nearby wetlands. Various metals (particularly nickel) and VOCs (benzene, TCE, DCE, and PCE) were found in the soil, surface water, and groundwater. EPA decided to try in-situ vacuum extraction of VOCs from the soils.[1] Groundwater will be pumped, air-stripped, and the VOCs filtered out by carbon adsorption.[2]

The Agency justified the expensive effort to decontaminate the site by noting the importance of drinkable groundwater for the area. Like Ottati and Goss, future development was a major consideration. "Remediation to the proposed cleanup levels will provide for the protection of the aquifer and ensure its availability as a potable water supply. The area surrounding the Site and along Exeter Road is currently experiencing residential and commercial development pressures. Therefore, EPA considers that it is reasonable and conservative to assume that the KES Site could potentially be developed for residential use."[3] Community activists, however, do not feel that EPA has shown that it will clean the contaminated groundwater [4]

**Tinkham Garage; Londonderry, New Hampshire.**

Londonderry is also located in the high-growth area of southern New Hampshire, along the region's major north-south artery, less than a one hour drive north from Boston. The ROD noted that "this is a high growth area and future development of land on site has been proposed."[5] The Tinkham site includes not only a garage, but 375 acres of residential and undeveloped land, including a large condominium complex which is one of the PRPs. As a result of contamination by VOCs (TCE, benzene, DCE, PCE, vinyl chloride), an aquifer which had serviced 450 residents is now unusable. EPA proposes to treat soils and sediments onsite , either by aeration, soil washing, or

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[1] This process will take two years and cost over $4 million.

[2] This will require five years and cost $1,878,800.

[3] Keefe Proposed Plan, pp. 8-9.

[4] Questionaire from Martha Bailey, June 1988.

[5] Tinkham Garage ROD Summary, p. 15.

composting. Wetlands will be restored. Groundwater will be air-stripped and carbon-filtered, and may be used as part of the soil flushing operation.[1]

Since an alternative water supply was installed, many of the community's concerns about groundwater contamination have dissipated, though several residences still utilize the bedrock aquifer. EPA has agreed to provide an alternative supply for those homes still using wells if contamination appears. Several respondents expressed concern about air pollution caused by work with VOC-contaminated soils. Others noted that residential construction in the site and neighborhood could affect groundwater flow and release VOCs from the soil. The other major community concern is the legal liability of condominium owners for the contamination. When a committee of the condo owners challenged the need for groundwater decontamination, EPA noted that groundwater use could not legally be restricted, and that development pressures required the expensive treatment. At this time EPA is considering a proposal to build a shopping center on part of the site.

**Re-Solve, Inc; North Dartmouth, Massachusetts.**

North Dartmouth is located just west of New Bedford, about one hour from Boston and less than a half hour from Providence, Rhode Island. The six-acre site is surrounded by wetlands and a hardwood forest. Land around the property is zoned for one-acre residential housing, though two auto-salvage yards and a privately-owned hunting area are nearby. All residences in the area (in 1980, 326 people lived within a half-mile of Re-Solve) get their water from private wells. Re-Solve Inc. operated as a waste chemical reclamation facility for nearly a quarter-century, closing in 1981. EPA found a variety of hazardous wastes on the site, including PCBs and a range of volatile organics (TCE, PCE, methyl chloride, and toluene). EPA will seek the destruction of all toxics, digging up and dechlorinating 22,500 $y^3$ of PCB-laden soils and 3,000 $y^3$ of contaminated stream sediments. The VOCs will be vaporized and condensed/contained in the two- year process. Pumping, air-stripping, and carbon adsorption/filtration of the contaminated groundwater

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[1]Soil decontamination will cost $3.6 million; groundwater treatment will take about 5 years and cost $4.16-$4.67 million.

will take 10 years.[1] A citizen on the community advisory committee told me that air emissions from the stripping of VOCs from groundwater is still a controversial issue.[2]

Public comments in the ROD illuminate how assumptions about the future use of the Re-Solve site influences risk assessment and the cleanup remedy. The Sierra Club, along with other respondents, asked EPA to use a "plausible maximum case" scenario instead of an "average case" to pinpoint the soil cleanup goal for PCBs meeting the designated $10^{-5}$ risk. The Agency replied that the "average. case" under future site use conditions would suffice to protect human health and the environment.[3] The PRPs, on the other hand, charged that the Feasibility Study had been based on the unreasonable expectation that the site must be reclaimed for unrestricted residential development. Other uses, such as conservation or industrial purposes, would be more consistent with existing land use.and federal regulations. EPA replied that there was no active industry near the site, which is zoned single-family residential and "is undergoing rapid development". The Agency noted that a property owner adjacent to the site had asked to build a residence there, and that the potential existed for residential development on the site.

A member of the Re-Solve CAC wrote, however, that "any future use of the site is pure speculation. Should the site ever be declared free of toxics (which even EPA says is doubtful), we would probably still not feel comfortable with its being populated in any way. Its best use would probably be as open space, since it is bordered on two sides by waterways, the Capicut River and Carol's Brook, and since the surrounding area is rural." This person also noted that EPA had received extensive criticism for its early work on the site, so two local citizens groups formed the CAC to work with EPA on Re-Solve. The CAC was particularly concerned about the effects of Re-Solve

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[1]Soil/sludge cleanup will cost $9.27 million; groundwater decontamination will cost $10.7 million.

[2]Telephone conversation with a representative of the Westport River Watershed Alliance, 27 June 1988.

[3] A table included in the ROD showed different soil concentrations associated ($10^{-4}$ to $10^{-7}$ levels of cancer risk) with present site use (trespassing) and future site use (residential), comparing avg case and plausible maximum case.

upon the Westport and Capicut watersheds, and possible contamination of private wells. The committee is requesting regular testing of wells by EPA or the state. The CAC member who wrote me now seems to trust EPA's work. "We are assured that after the cleanup process is completed, adequate tests will be taken to determine the state of the site. At that time any plans [to use the site] would be dependent upon the effectiveness of the cleanup."[1]

**Williams Property; Middle Township, Cape May County New Jersey.**

The 5.6 acre site is located in a wooded area, zoned for agricultural and residential uses. Theodore Williams lives on this property. In 1979 he gave permission for 200-300 55 gallon drums of "unknown liquids and solids" to be stored on the property. After being ordered by the state to remove the barrels, unable to get the local landfill to accept full barrels, Williams drained the drums onto the ground. As a result, a large plume of contaminated groundwater forced Williams' well to be closed in 1984. Later, evidence of widespread dumping of refuse and construction debris on the site was found. Primary contaminants include bis (2-ethylehexyl) phthalate, PCE, methylene chloride, and xylene. EPA plans to excavate, and incinerate off-site, about 700 $y^3$ of contaminated soil, and to pump and treat the groundwater.[2]

Approximately 3550 people live within 3 miles of the site. Also within that radius are three nursing homes, a county park, the county office complex, and two schools. Nearby campgrounds boost the population within one mile of the site from 485 to 4740 during the summer. The site was not fenced in 1986, and the ROD found ingestion of soil by children to be the greatest potential risk. The toxic groundwater plume threatens the water supply of about 60% of Cape May County's residents, though all local residences downgradient from the site have been connected to municipal water. The aquifer is also used heavily for irrigation and fire control purposes. In addition, gravel pits in the area, filled with groundwater, are heavily used for swimming and fishing. The ROD notes that "extensive development has

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[1]Letter from P.O.N.D. (Precint One of North Dartmouth) member, 12 July 1988.

[2]The estimated captial cost of this remedial action is $513,750, with annual operation and maintenance of $64,600. Williams Property ROD.

been planned for the region and the purity of this [groundwater] reserve is paramount to the plan." As a result, all development within a one-mile radius of site has been banned by the county until either cleanup is complete, or EPA determined the exact dimensions of the contamination. Property values have almost certainly declined as a result of the moratorium.

**Picillo Farm; Coventry, Rhode Island.**

Twenty miles southwest of Providence, Picillo Farm has generated considerable controversy and community anger, not only because of the origin of toxic contamination, but also as a result of past EPA actions. Coventry is the only residential area that I examined where EPA decided to create an on-site landfill instead of decontaminating the soil, and where the Agency originally selected groundwater monitoring instead of treatment. The eight-acre site had been a farm before the owners allowed the illegal dumping of chemical wastes on the land for several months in 1977. EPA found a variety of VOCs, phenols, and PCBs on the site.

There are about thirty to forty dwellings within a one mile radius of Picillo Farm, but the site is surrounded by marsh and thick woodlands, and is thus very difficult to reach The Agency cited these characteristics as the primary reason for rejecting soil decontamination. The site is too difficult for people to reach, and infrequent exposure means low health risks. Besides, the ROD notes, if someone falls in the swamp they'll immediately clean off the toxic muck, thereby removing any risk. Similarly the contaminated groundwater presents no risk because no one drinks it.

The community, of course, wanted the contaminated soil removed, and the groundwater pumped and treated. They distrusted the effectiveness of promised site security, because of the area's isolation. They expressed the concern that their drinking water could become contaminated by the plume of toxics, particularly. if expected development along a nearby highway disturbed the area's hydrology. They also complained that "Real Estate interests are telling clients everything is cleaned up", and told EPA that "the area is critical for future Rhode Island water development". EPA noted that groundwater withdrawal rates were very low, and that the flow was unlikely to change even with expected development. The Agency promised to monitor the groundwater.

In interviews and public meetings in 1984 area residents expressed the concern that the Picillo family would continue to own and manage the site and surrounding property. They asked a government agency--any agency--to take control of the land, . EPA responded that "as a policy, EPA does not take ownership of Superfund sites." The Agency noted, however, that it was considering "providing funds to have an acceptable party assume ownership of the site". Nothing has happened since then. Coventry's planning director, James Finger, told me that the property's owner is still collecting rent on some houses next to the site.[1]

Finger complained about the work that EPA and the Rhode Island Department of Environmental Management had already done on the site, saying that they made the problem worse by crushing some of the barrels and blowing up others, which has forced more contaminants into the groundwater. With that kind of work, he said, it won't be clean in 100 years. In addition, residents have reported chemicals in the marshes 1/2 mile from the site, so the town fears that groundwater contamination is much worse than set forth in the ROD. There is still, Finger told me, no schedule for groundwater decontamination.[2] He also complained that, until about six months ago, there was terrible communication and coordination between EPA, the state, and the town. Things have improved now that the site manager has remained in his job for a while, and has made a point of seeking and maintaining contact with the town.

Ten years ago, Finger told me, EPA declared that Picillo Farm was so isolated that a contained hazardous waste site did not place people at risk. Now, however, development pressures are increasing. Coventry has refused to seize the property, fearing liability, though taxes have not been paid by Picillo. Last year George B. Dupont applied for a building permit to build near the site. The town engineer recommended that the town deny Dupont a building permit because of the contaminated groundwater. Dupont's lawyer informed the town that it did not have the authority to refuse a permit. Coventry therefore passed a special building moratorium, forbidding new building permits within an 1800' radius of the Picillo Farm property line. The

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[1]Telephone interview, 29 June 1988.

[2] This indicates a change from the "no action" preference set out in the ROD.

town also requires a series of groundwater tests before any new construction is approved within an 1800' radius beyond the area where building is prohibited. This moratorium is designed to halt construction until EPA completes a hydrology study to determine the dimensions of the contaminated groundwater plume. Dupont is now suing the town. Proposals to build eighty homes near the site await the result of his lawsuit.[1]

After the site and the groundwater is finally detoxified, Finger said, it and the surrounding area might be used for something like a firing range, but never a residential area. Any residential development would mean that the groundwater would have to be tested constantly, since the geology of the area means that the groundwater flow is quite unpredictable.

All of these sites were undeveloped and marginal land, surrounded by rural residential or mixed-use properties. Development pressure, however, increased the residential density near each of the sites, and ended the marginal nature of the land. Local residents are invariably concerned that their community is growing and changing at an uncontrolled rate. Any potential development on a Superfund site must not only overcome health concerns, but also faces a community's fear of change. Future site use, however, seems less controversial than the effects of EPA's cleanup actions on the surrounding properties, particularly where groundwater contamination spreads the contamination. The Agency has acknowledged that caps and other landfill technology cannot permanently isolate toxics from groundwater. Therefore, particularly where a community faces a combination of rapid development and dependence on groundwater, EPA may find it necessary to ensure decontamination of the site and groundwater.

The Superfund process appears to scar relationships between some communities and EPA. Neighborhoods are angered when contaminated sites are left unfenced and unrestricted during the RI/FS process. Where EPA plans incineration of contaminated soil and sludge, neighbors of the site fear the toxics will become airborne. The most common complaint, however, was of poor communications between EPA and the towns. Technical uncertainties, of course, may prevent EPA from giving townspeople the

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[1]Town of Coventry, Rhode Island, Ordinance No. 4-88-1049; "Building ban imposed near Coventry dump," Providence Journal, 24 Februry 1988.

precise data sought, such as the exact dimensions of a contaminated groundwater plume.[1] Unknowns may be easier to deal with, however, if a community feels that it is working with EPA instead of being a helpless spectator. The Technical Assistance Grant program is a good instrument, but the Agency must be willing to work with the town and state to coordinate site investigation, institutional controls, cleanup, and monitoring.[2] This is critical where development pressures have created a sense of insecurity in communities.

## Industrial Areas

Sites in industrial areas appear to generate less controversy than residential zones. This may be because pollution is an acknowledged byproduct of industrial production, and such sites have always been off-limits to residential development. Towns isolate industrial zones from residential areas., and usually housing nearest industries is the lowest quality in town. In rural areas industries may own such large pieces of property that contaminated sites are far removed from residences and other businesses. In many cases, as long as no one faces an immediate health threat, industrial pollution is seen as nasty but necessary. When a contaminated site threatens the immediate health or welfare of the community, however, controversy explodes. In all cases towns tend to be more tolerant of containing instead of treating toxics in industrial areas than they would be of similar actions in residential or developing areas.

### Chemical Control Corporation; Elizabeth, New Jersey.

The Chemical Control Corporation operated from 1970 to 1978 as an industrial (i.e., hazardous) waste treatment, storage, and disposal facility. Throughout its operation Chemical Control had been cited for various

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[1]Martha Bailey, involved with both the KES and Ottati and Goss site, complained that the KES site may not be clean for a century. "EPA does not outline the depth, shape and size of ground water aquifers so no one knows where [or when] clean water will be available." Questionaire, 8 June 1988.

[2]Citizen activist Martha Bailey said that her organization would only be satisfied if they were "part of all design, implementation, testing, and [could] approve all cleanup methods."

pollution violations; in 1977 an illegal dumping incident at the site led to the jailing of the owner. The property consists of 2.2 acres alongside the Elizabeth River, across from Staten Island, in an area long dominated by heavy petrochemical industries. Densely populated neighborhoods are directly across the river from the facility, which had been destroyed by fire in April 1980. Before the fire the state had removed most of the stored toxics and some of the contaminated soil, covered the site with one to three feet of gravel, and put a security fence around the property.

EPA found the soil, groundwater, and river sediments badly contaminated with VOCs (TCE, PCE, DCE, and benzene) and PCBs. The Elizabeth River and groundwater were so badly polluted from the vast array of industries in the area that EPA decided to treat the water or sediments. The Agency projected that excavating and transporting soil posed high health risks, and found the site too small to install an incinerator. EPA therefore picked an in-situ solidification/fixation process to contain the toxics.[1]

The Agency has been criticized for picking a treatment which failed under similar circumstances. The criticism has come from the local press and officials, and environmental and Congressional "watchdogs"[2]. Residents of the area have shown little interest in the RI/FS process for this very dangerous site. The apathy may be because the state had already removed all visible toxics from the site, or because the past problems (the many civil citations, criminal conviction and jailing of the owner, and the terrible fire) made current issues seem trivial. The heavy petrochemical industries alongside the site may have lessened the importance of remaining site contamination. EPA acknowledged surrounding land use when it decided not to treat the groundwater or river sediments. Residents silently acknowledged the same situation by failing to comment on the Agency's actions. The combination of past circumstances and long-term land uses

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[1]The present-worth cost of this treatment is estimated at $7,425,000.

[2]"Right Train," p. 30. The OTA, in "Cleaning Up," noted that there was "an unusal interest in the RIFS and ROD process in reusing the [Chemical Control] site and constructing something on it, despite the uncertainty of the selected cleanup, despite the contaminated materials to remain onsite, and despite the other nearby sources of contamination."(p. 25) I found, however, little indication of future land use in the ROD.

meant that the limited cleanup picked for Chemical Control, though criticized by some, had little social or economic effect on the community.

**Sodyeco; Charlotte, Mecklenburg County, North Carolina.**

By comparison, Sodyeco is a huge industrial "park" of 1300 acres, forming a buffer between the rural Mecklenburg Country and the industrial section of Mount Holly City across the Catawba River. About twenty to thirty people live within a quarter-mile of the site, which is only 20% developed. Sodyeco, a division of Sandoz Chemicals since 1983, is one of the area's largest employers, producing a variety of petrochemical products. The factory had manufactured dyestuffs since 1936, landfilling wastes on the site. Sandoz, as the responsible party, produced the RI/FS for the EPA, and found high levels of TCE, PCE, DCE, benzene, toluene, and xylene. EPA decided to treat different areas of the site in different ways: part capped with asphalt, part treated in-situ, and part excavated and incinerated off-site. Groundwater will be pumped and treated.[1]

Local residents had few comments on the RI/FS. Community concern about Sodyeco had been high in the 1960s when the company burned solvents outside the plant. Sodyeco terminated open-air burning in the late 60s, and controversy about the plant ended with it. No one objected to Sandoz carrying out the study, and--other than two questions about potential private well contamination--no one questioned either the study or the cleanup chosen by EPA. The site is, of course, both industrial and undeveloped, and is therefore both isolated and already established as marginal property. Sodyeco is also the largest employer in the area, and Sandoz seems to have made an acceptable effort to remedy a situation the corporation did not create. These circumstances appear to have minimized the social and economic effects of the contamination upon the community.

**Industriplex; Woburn, Massachusetts.**

Vastly different from both Sodyeco and Chemical Control Corporation is the Industriplex site about thirty miles north of Boston. The site includes

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[1]Cleanup costs are projected to be $2.089 to 3.865 million.

245 acres, and is about 3/4s of a mile from residential neighborhoods. Various industries since 1853 have buried nearly every industrial by-product known to man, including wastes from the manufacture of glue (animal hides and carcasses), sulfuric acid, arsenic insecticides, acetic acid, munitions, and organic chemicals. These materials were discarded in wetlands, lagoons, and as construction material on the site. After the lowlands were filled in 1934, the piles of wastes reached nearly forty feet tall.

A developer excavating and grading part of the site for a new industrial park in 1979 disturbed large stacks of buried animal hides, releasing strong hydrogen sulfide gases. The resulting infamous "Woburn odor" generated a stack of lawsuits and restraining orders, which the developer ignored. The glue wastes were removed and stacked in a small pond on the northern edge of the site, 40' tall, and 250' by 100'. The state environmental agency and EPA have, since 1980, sprayed a temporary latex cap across an exposed arsenic and lead deposit, and fenced the site to reduce human contact with the contaminated soil. Most of the hazardous waste is in the western 100 acres, and includes approximately one million $y^3$ of soil contaminated with not only decaying animal carcasses, but also metals[1] and VOCs (including benzene and toluene).

EPA decided to install a permeable cap over certain areas after soils and sludges were graded, and surface water, which is not used, will be monitored. RCRA post-closure regulations will be followed. "Hot spots" in the contaminated groundwater plume will be pumped, air stripped, and discharged. To cut down on air pollution, the pile of animal carcasses will be stabilized, an impermeable synthetic membrane cap installed, air emissions from the cap filtered, and the air monitored.[2] This treatment is far from decontamination of the toxics stored at Industriplex.

The ROD notes that the "site development issue is one of serious community concern." As the RI/FS process unfolded, conflict erupted between those who wanted to push industrial development--City of Woburn, surrounding communities, Chamber of Commerce--and the majority of the

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[1] Arsenic (avg. 228 ppm, up to 30,800 ppm), lead (avg 1,263 pm, up to 54,400 ppm), chromium (avg. 718 ppm, up to 80,600 ppm)

[2]Estimated capital costs are $12.6 million, plus O & M of $285,000 to $311,000.

members of the citizens advisory committee, who opposed any development of the site. A federal consent decree had been issued requiring cleanup of the site before any development. All parties raised questions about responsibility for site closure and post-closure activities. Commenters were particularly concerned about who would determine when EPA's action was completed, who would oversee closure, and how monitoring and the enforcement of compliance with site restrictions would be accomplished. The Agency answered all of these questions in the ROD, but declared it too soon to address the issue of post-closure monitoring and restriction enforcement. Given the history of the site, and continued trespass in some of the most contaminated areas, that question was probably critical to the community.

Unlike the Sodyeco site, residents distrusted the RI/FS done by Stauffer, the responsible party. EPA rejected several of Stauffer's recommendations, deciding on stricter standards. The CAC wanted more control of the actual cleanup and post-closure operations. They wanted to review specific remedial design plans, and any plans for monitoring the site for which Stauffer had responsibility. They also asked that Stauffer's 15-year monitoring plan include a process which allowed the CAC to review proposals to alter the site, with the filing of annual reports by the monitoring party to provide details on maintenance, security, and any alterations of the site.

The community showed great concern about future site development. The CAC asked that the piles of animal carcasses be completely restricted from any development, use, or alteration after the completion of remediation work. EPA received other requests to ban future development of those areas. The Agency, however, replied that such restrictions are "unnecessary and not warranted. The Agency believes that portions of the Site may be developed in some limited fashion so that the effectiveness of the implemented remedial action is not compromised. The Agency proposes to control future site development through the use of institutional controls."[1] The CAC also suggested that the federal government acquire sealed site areas and turn the

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[1]Industriplex ROD p. A-25-27.

title over to the City of Woburn, but EPA did not reply to this idea.[1] The community seemed most concerned about the source of the infamous "Woburn order", and obviously had been badly shaken by the developer's disregard of court and government agency orders.

**Renora Inc.; Edison Township, Middlesex County, New Jersey.**

From 1978 to 1982, Renora Inc. operated a hazardous substance transportation, storage, and disposal facility at a one acre site alongside the New Jersey Turnpike. During that time, the town and state cited Renora for numerous violations of health and safety laws. After Renora abandoned the site, Federal and state investigations revealed that the soil and groundwater was contaminated, primarily with PCBs and polycyclic aromatic hydrocarbons (PAHs), but also with VOCs and heavy metals (including lead). EPA decided to excavate PCB-contaminated soils and treat them off-site, and biodegrade PAH-contaminated soils using the groundwater as an irrigation medium in the process.[2]

Renora is in a light industry zone, next to welding, machinery, and electric supply stores, and an auto repair shop. Within 2000' of the site is a residential zone with a nursery school, a senior citizens' center, and an apartment complex. The Renora ROD is unique in that it contains an endangerment assessment for different uses of the site. The ROD estimates cancer risks for light industrial use and for residential use of the contaminated land.[3] Potential land use is considered with each remediation alternative. Most alternatives specify "future light industrial uses", but EPA

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[1]This request, noted in the Industriplex ROD on p. A-24, indicates that the CAC and the City did not disagree on the issue of site development, as the ROD stated earlier on p. A-4.

[2]EPA has estimated that the present worth of the remediation costs will be between $1,401,000 (if the PCB-laden soil is landfilled) and $6,021,000 (if the soil is incinerated).

[3]"Estimation of risks to workers associated with this [light industrial] exposure scenario indicates that the potential excess cancer risks are $1 \times 10^{-6}$ and $1 \times 10^{-4}$ for the average and plausible maximum scenarios respectively." With residential development, those risks would rise to $2 \times 10^{-5}$ and $1 \times 10^{-3}$. Renora ROD, p. 19.

noted that, if the preferred alternative is successful, land uses for the Renora site "should be almost unrestricted".

John Grun, the Health Officer for Edison Township, expressed some doubts about EPA's ability to completely decontaminate the area, "because the site boundaries are sometimes viewed bureaucratically in terms of block, or lot, and not necessarily as they should in terms of pathways of migration of contaminants." He also criticized the state and national politics involved with the site. New Jersey's Department of Environmental Protection created a "media blitz" about toxics at the site, but lacked "the intention or money to see the project through." In addition, "the community was thrilled to see removal of leaky drums and soil, and was dumbfounded to see recent attacks on [EPA's] remediation by [Congress's] Office of Technology Assessment!" The recent report on Superfund by environmental groups also criticized EPA for failing to remediate lead contamination at Renora.[1] Despite these problems, Grun felt that EPA "can and does function effectively when it is permitted to give real control to [the] site managers." [2]

EPA characterized public involvement as "relatively limited", though local officials and the press have been quite concerned about Renora. During the comment period one local official requested guidance from EPA about potential land uses for the site, and asked for that information in writing. The Agency promised that the ROD would contain this information. Mr. Grun believes that EPA's plans will allow commercial or industrial use of the Renora site. He noted that "a park, shopping center, store, or industry, is acceptable. The areas [Renora and another nearby Superfund site] are now used by industries and I see no good reason why it cannot continue."

**Waldick Aerospace Devices; Wall Township, New Jersey.**

Waldick is an inactive industrial facility located along an industrial-commercial corridor, Highway 35, that separates largely undeveloped land on the west from developed land on the east. An uncontaminated building on the north side of the site is now used as a retail outlet for plumbing supplies. Across the highway from Waldick are two automobile dealerships. A nursery school is just south of the site. Most of the area contains woodland,

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[1] "Right Train," pp. 44-45.

[2] Letter from Mr. John Grun, 5 July 1988.

agricultural plots, and scattered residences. The state and EPA found that the site had contaminated soil, groundwater, surface water, and stream sediments, polluted with metals (chromium, cadmium, nickel, lead, and zinc) and VOCs (TCE, Bis [2-ethylhexyl] phthalate, and PCE).

The first ROD, signed in September 1987, dealt only with removing the source of contamination by treating soils. EPA and the state chose to decontaminate and remove toxic residuals from Waldick by air stripping all contaminated soils to reduce VOC levels, excavating and disposing off-site all residuals and metal-contaminated soils above the cleanup goals projected for the site, and decontaminating or demolishing the remaining buildings. Site fencing, well restrictions, and a comprehensive monitoring program with additional test wells were also part of the remediation chosen.[1] Any re-use of the site must await treatment of other contaminated media.

Residents of the township and Monmouth County were very involved with this site. A public meeting in December 1985 drew about 100 participants. Additional comments were received in July and August 1987. Residents had few complaints about EPA's remediation decision. Most comments focused on the effects of the site on nearby property, particularly because of the delay for ground and surface water remediation. Businessmen were worried that the site affected their trade, and also expressed concern that owners of nearby properties might be held liable for any harm to individuals caused by migration of toxics. Users of private wells for irrigation asked to have their wells tested for possible contamination.

Residents expressed little opposition to post-remediation use of the site. One person asked if the site was securely fenced with public access restricted; EPA confirmed this. Another resident asked about demolition of the contaminated buildings; EPA responded that decontamination might suffice, and that "EPA's responsibility is to maximize the potential for re-use of Superfund sites."[2] Another wanted EPA's assurance that the area would be completely cleaned up, and EPA responded that the site would receive exhaustive testing. During the comment period, EPA received information that a housing development was being constructed near the site. EPA's response noted their surprise at this development, but noted that local,

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[1]The estimated net present worth of capital costs and O/M is $3,120,603.

[2]Waldick Aerospace ROD, Community Relations Plan, p. 7.

county, and state officials had imposed a number of zoning restrictions on the area around the site. The Agency looked into it, and found that the building was upgradient of the Waldick site and met all flood control requirements.

Local officials expect redevelopment of the site after EPA completes its work. The Monmouth County Public Health Coordinator wrote that Waldick "will probably be used for light manufacturing by [the] present owners." The site is zoned industrial/commercial, and since the area is "saturated with shopping centers...light industry is the logical choice." . Currently a light metal fabrication facility operated on the site, and he expected that use to continue. He characterized public concern as "limited", and noted that the site was not adjacent to residential areas and that the surrounding property was owned by the company that held title to Waldick. He did not feel that a different remediation plan would have changed his opinion of site redevelopment, and trusted EPA's judgement of the cleanup work. The only significant issue for the community, he wrote, was "identification and damage assessment of [the] 'responsible party'."[1]

**Brio Refining; Harris County, Texas.**

The 58.1 acre site, located twenty miles from Houston, operated as a petrochemical waste recovery facility and petrochemical production plant between 1957 and 1982. About 500,000 to 700,000 $y^3$ of soil on the site, is contaminated with very high levels of various VOCs, including DCE, methylene chloride, toluene, chlorobenzene, and TCE. EPA decided upon destruction of toxics in all soils that pose a health risk, choosing infra-red incineration unless the aqueous-phase biodegradation proposed by PRPs is first proven effective at the site.

Unlike the other industrial Superfund sites, the area near Brio Refining is heavily populated. Several subdivisions, a junior college, an elementary school, and a hospital are located within a half-mile of Brio. Within a mile of site the population (in 1985) is 5,751; within four miles reside 71,000. When determining the cleanup methodology, EPA projected

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[1]This material is from a questionaire completed by Lester W. Jargowsky, M.P.H., Public Health Coordinator, The Monmouth Country Board of Health, Freehold, New Jersey.

that the site would remain "a secured industrial facility" in the future.[1] As a result, EPA and local residents disagreed on how extensive treatment should be. The community asked that "all measurable amounts of affected soils found on soil should be treated. EPA, however, proposed to treat "only affected materials and soils that pose a health threat." As a result, "some measurable amounts of contaminants will remain on site, however, deed restrictions will be imposed and site access will be controlled." The ROD did not specify the nature of those restrictions.

Residents also expressed concerns about a decline in property values, and a halt to economic development in the area, if complete decontamination was not accomplished. The only remedy gaining the consensus of the community was off-site disposal, with all measurable contaminants removed. In what it saw as an effort to meet community concerns, the Agency asked "any settling party" to look at "creative design and landscaping ideas, in cooperation with local residents, that might reduce any adverse economic impact the site might have on the area and enhance the aesthetics of the site." The ROD declared that any more expensive solutions "which account for local property values and economic development" lay outside EPA authority and must be paid for by the state.

As in other sites, controversy grew out of the effects of EPA's treatment decision, not on the site itself, but upon the surrounding community. Efforts to "enhance the aesthetics of the site" may be useful. The neighborhood, however, needs to be assured not only that contamination from the site will not reach their homes, but also that the site will not be accessible to either future intensive uses or open to children. If complete decontamination of the site could not be accomplished, a precise plan of institutional land use controls should have been developed with the CAC and set forth in the ROD.

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[1] "Using a trespass exposure scenario, which assumed that the site would remain a secured industrial facility, target removal and treatment levels for selected chemicals were developed. These target levels were based on a $10^{-6}$ increased cancer risk for carcinogens and on an acceptable chronic daily intake for non-carcinogens. The endangerment assessment also examined an unrestricted access exposure scenario which indicated that greater volumes of affected materials and soil would have to be treated should exposure to the site increase."

Like sites in developing residential areas, post-remediation use of industrial Superfund sites will be shaped by public perceptions of the property and its effects on the commonweal. Industrial use of a site with isolated wastes, such as Sodyeco, appears to generate little controversy, particularly when that property (and the toxics it contains) is far from residential areas. Sandoz's efforts at Sodyeco, and their operating record for the past two decades, also appear to have eased continued use of the site. New industrial developments on old sites, with the disruption and alterations of the land, represent more of a threat to the surrounding community. The primary goal of many Woburn residents was a permanent ban on any use of those parts of Industriplex where the animal carcasses were buried. Communities do not object to the reuse of a Superfund site, but insist that EPA ensure toxics cannot spread through air, water, or soil to the surrounding residential areas. Residents near the Brio Refining site did not challenge EPA's assumption that the site could be reused as a "secured industrial facility". The community did seek a more complete scouring of the site, primarily to ensure the purity of surrounding properties. At both Industriplex and Brio Refining residents needed detailed descriptions of institutional controls or limitations on the future use of those sites from EPA. EPA appeared to gain credibility when it examined post-remediation land uses in the ROD, as it did at Renora.

## Undeveloped Areas

Many Superfund sites, particularly in the south, are located in sparsely populated rural areas where development pressures do not exist. Often land near the sites is used for recreation, particularly hunting, and fishing. The lack of both development pressures and an activist local government can blunt the perceived socio-economic effects of a Superfund site. Yet anticipated development, or a community's dependence upon endangered resources, can make the cleanup of unused land a sensitive issue.

**Cleve Reber; Ascension Parish, Louisiana.**

The 24.6 acre site between Baton Rouge and New Orleans was used as a municipal and industrial waste landfill between 1970 and 1974. East and south of the site is swamp land with dense vegetation. North and west the land is sparsely settled with some agriculture. Contaminants, primarily

hexachlorobenzene and TCE, have been found in a shallow aquifer under the site and could threaten surface water since the site lies in the 100-year flood plain. Area residents draw their water from a deeper aquifer, separated from the contaminated groundwater plume by 220' of clay.

When EPA held the first public meeting in June 1985, the Agency had not found any contamination of the shallow unused aquifer, considered the site an impervious natural vault, and therefore proposed simply capping the toxics. After discovering the aquifer contamination, however, the Agency decided to incinerate all toxic wastes onsite and cap the residuals. Since the aquifer is not used, and destruction of the toxics will remove the source of contaminants, groundwater will be monitored but not treated. The entire site will be monitored for thirty years. EPA did not propose site restrictions or other institutional controls.

Residents, including the local environmental group Save Our Selves, opposed the initial EPA capping proposal, and asked that the toxics be completely removed from the site and put elsewhere. After EPA changed its recommendation, questions and comments on the thermal destruction remedy focused on the potential effects of incineration Potential drinking water contamination does not seem to have been an issue. No land use issues were raised in either the public meeting or during the comment period. Public reaction to EPA's selection of cleanup remedies was quite different from that which occurred at the Geiger site in South Carolina.

**Geiger (C&M Oil); Charleston County, South Carolina.**

The five acre site was permitted between 1969 and 1971 as a waste oil incineration operation. Eight unlined lagoons were constructed by Adams Run Services, Inc. to hold oil. After public complaints that oil overflowed from the lagoons, the state ordered the site closed. C&M Oil purchased all the reclaimable oil in 1974, but decided not to recover the oil. The site was purchased in 1982 by George Geiger, who filled in the lagoons with local soils, and uses the site to store equipment for his company, Pile Drivers, Inc. The Remedial Investigation found high levels of VOCs (including TCE, toluene, and benzene), lead, chromium, and mercury in the soil and groundwater. EPA chose on-site thermal destruction of contaminated soils, chemical

fixation of residuals and metals, and extraction and decontamination of the groundwater plume.[1]

The Geiger site is located about ten miles west of Charleston, South Carolina, in a sparsely populated area four miles from the small town of Hollywood. About ten residences are located adjacent to the property, and several small businesses are about a half-mile away along Highway 162. Forests, wetlands, and some agricultural lands surround the site. The nearby marsh and estuary streams are critical habitats supporting several endangered species.

The residences in the area get their drinking water from private wells. The state environmental agency had recommended in 1985 that those using groundwater find another water source. The RI/FS, however, found that the levels of contaminants in the wells met federal guidelines (MGLs). Yet the document also projected that the contaminated groundwater plume could threaten the habitat of endangered species in ten to fifteen years. Local officials and citizens clashed with EPA representatives at public hearings about the contaminated well water. Residents, hoping that EPA would help obtain an alternative water supply, objected to animals receiving more consideration than humans.[2] They also asked EPA to test more of the wells downgradient from the site, instead of relying upon a projection of the

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[1] Total present worth cost of EPA's remediation decision is estimated at about $8 million. The recent environmental coalition report on Superfund presented the Geiger ROD as an example of the "successful implementation of the remedy selection process"."Right Train," pp. 35-36.

[2]Ironically, while EPA is critcized by environmental groups for neglecting the risk to ecosystems posed by toxic wastes ("Right Train," pp. 64-70), the residents of Charleston County were upset when EPA addressed this issue. "True, you have endangered species, but when you put endangered species, like bald-headed eagles, above human lives, these children and these people have to drink this water, which they have been told is not safe to drink. They have to haul water 1500 feet, and you're putting all of this and their need for a bald-headed eagle... I think somewhere the human element is far more -- You're talking endangered species when we're talking humans here." Geiger ROD, p. 16.

plume's size. The conflict between the advice given by the state agency and EPA's findings generated suspicion and alarm among residents.

EPA stated that its remedy would remove all risk of human and environmental contact with toxics, allowing the current land use (storage of construction equipment) to continue. The Agency did not examine whether residential development on the site would change this risk assessment, but ruled out the need for long term maintenance or institutional controls. The Mayor of Hollywood, Lela Dickerson, objected to the current and proposed controls for the site. "The Geiger Site is not fenced in nor is the area designated as a Hazardous Waste Site...this should be done. I feel that the deeds of this property should be restricted to allow limited use and should never be allowed to be used as residential area." Mayor Dickerson was particularly concerned that the property had changed owners three times since 1969.[1] Local residents, represented by Mayor Dickerson, EPA's primary contact, had been given conflicting advice, and distrusted outside agencies.

**Palmetto Wood Preserving; Dixiana, South Carolina.**

Palmetto Wood Preserving is a 5-acre wood-preserving facility that operated between 1963 and 1985. The company used products which included arsenic, copper, chromium, and pentachlorophenol compounds. After the state received several complaints about green liquid coming from the site during heavy rainfall, an investigation found high concentrations of chromium in the site's soil. The state also found high levels of chromium and copper in a private well near the site. EPA decided to excavate and flush soils on-site, extract, filter and treat the groundwater, and to provide an alternate water supply for the residences with contaminated wells.[2] The ROD gives little information about the area around the site. At a public meeting in August 1987 local residents "seemed to favor treatment of ground water and soil flushing of contaminated soil".[3] Perhaps because this was also EPA's choice, no comments were received by the agency after the meeting. There is

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[1]Letter to Chief of the Remedial Action Section, EPA Region IV, 16 January 1987, made part of the ROD (p. D-5).

[2]The estimated capital cost of the remedy at Palmetto is $1,393,000, with an annual O/M of $176,163.

[3]Palmetto Wood ROD, p. 37.

no evidence that land use issues, or controversy about the effect of remediation upon the community, emerged at Palmetto Wood.

**Lowry Landfill; Aurora, Colorado.**

Anticipated growth can turn even undeveloped areas into controversial Superfund sites. The Lowry Landfill site contains 400 acres, and is part of a 2700-acre municipal waste landfill owned by Denver.[1] The City of Aurora, north of the site, is considering annexing properties south and west of the site, which is projected to be the city's future center. In addition, a recently approved international airport will be built nearby, and the highway east of the site will become both the primary route between the airport and Denver and part of a new Beltway around the metropolis. Aurora's and Arapahoe County's Comprehensive Land Use Plans anticipate commercial and dense residential development around the site, and the highway is expected to generate commercial development extending a half mile into the Superfund site. The City of Denver continues landfilling municipal waste at the north end of the property.[2]

Like Coventry with the Picillo site, "uncertainty about health-related risks" led Aurora to prohibit all development within a one-mile radius of the Lowry site until the contamination is pinpointed or stabilized. Carol Maclennon, Chairperson of Aurora's Lowry Task Force, and who works for the Aurora City Manager's Office, told me that the area is largely undeveloped now. "Because of the recent severe downturn in Denver's economy, there is no current pressure for actual development. Nevertheless, area landowners indicate that because of Aurora's ordinance, they have already suffered economic impacts in the millions of dollars due to lost opportunities for the sale of their properties. If the selected remedy for the site supports the maintenance of a significant buffer around Lowry, economic

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[1]The Lowry ROD has yet to be published, but the initial site information update issued in June 1988 indicated a very complex contamination problem due to the geology of the site, the types and volumes of wastes discarded there, and the disposal practices at Lowry. EPA Region VII, Superfund Program, "Lowry Landfill Information Update No. 1," (June 1988).

[2]Letter from Carol Maclennon, Chairperson, Aurora Lowry Landfill Superfund Taskforce, 21 June 1988.

impacts will accrue in the form of foregone development opportunities to the private sector and tax revenues to the City." In addition, a new $33 million high school has not yet opened due to a slower than projected population growth in the area near the landfill, and a parent's group has formed to oppose opening the school.[1]

These circumstances indicate that both the speed and thoroughness of EPA's cleanup decision will be subject to great public scrutiny. Maclennon feels that the issue of greatest significance to the community will be the risk from VOCs released during air-stripping. "The public is aware that ambient air monitoring is an imprecise science and fears both (1) that detection of contaminants will be difficult and (2) that EPA will allow exposure to unsafe levels of airborne contaminants simply because the health effects of long-term, low level exposure to these compounds have simply not been identified and quantified."[2]

Groundwater contamination seems the primary concern in undeveloped areas. At Geiger it seemed that any level of toxics--even levels meeting EPA's MGL standards--were unacceptable. The situation was exacerbated by conflicting evidence in the ROD; contaminated groundwater was projected to endanger eagles but dismissed as too low to affect humans. Advice from a state agency which conflicted with that given by EPA assessment also seemed to discredit EPA's assessment. Undeveloped rural areas are particularly sensitive to groundwater contamination because their private wells cannot, as a practical matter, be regularly tested. At Cleve Reber, the evidence consistently showed a thick layer of clay between the contaminated unused shallow aquifer and the deep aquifer used by residences in the area. This seems to have eliminated the groundwater contamination issue. EPA also demonstrated concern for keeping drinking water pure when the Agency changed its remediation strategy after finding that the unused shallow aquifer contained toxics from the site.

Post-remediation use of Superfund sites does not seem as sensitive an issue in undeveloped areas as in developing residential communities. At the same time, EPA should seek to meet a town's desire for land use restrictions,

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[1] Ibid.

[2] Ibid.

particularly if the Agency mentions a specific land use in connection with the remediation strategy. For example, the Geiger ROD mentioned that the cleanup chosen would allow the current storage of construction equipment at the site to continue. Yet EPA in the same document ruled out institutional controls to maintain that use, a decision which drew strong protests from the town's mayor. Anticipated development may lead a community to ban new construction near the site until the town is reassured that the site does not threaten surrounding properties. Such moratoriums have been instituted in Aurora, which sees the likelihood of rapid growth around Lowry Landfill, as well as in Middle Township, Cape May County, N.J., (Williams Property) and Coventry, R.I. (Picillo Farm) where development is a more immediate issue.

# IV

## *Superfund, Communities, and Land Use Issues*

Too few cleanups have been completed to permit an analysis of post-remediation use of Superfund sites. In addition, EPA has not tracked the use of the sites which have been deleted from the NPL. EPA has recently asked to declare its remediation work complete at several sites and drop them from the NPL. SARA requires EPA to re-evaluate sites deleted from the NPL, where contaminants were left, at least once every five years.[1] The Agency should, in addition, track the use of all sites after Superfund remediation work is completed. Information gathered will not only indicate what land use can be expected at contaminated sites, but would also show how communities perceive EPA's work. Tracking sites would also be another illustration that EPA cares about the concerns of communities which had been subjected to toxic contamination.

Superfund sites in developing areas are particularly controversial. Rapid residential development creates a shockwave of socio-economic change that heightens concern about the community. Increasing demands on limited resources, particularly groundwater, leads a community to carefully guard what they have. Distress about growth is intensified when a Superfund site is found in the town. Property owners near the site, who may have hoped to sell their land for profit, find their property less valuable than that further away from the site. Towns may even ban development within a half mile or more of a Superfund site. Newcomers, who may have moved to the area to escape the unhealthy city, are outraged to find an unexpected toxic threat in their pristine country home.

Residents of developing areas are thus more likely to seek as complete a decontamination of the Superfund site as is technologically possible. They will also seek the destruction of off-site contaminants, such as groundwater, even if not used, and pond or stream sediments. Any on-site residuals must be immobilized and their storage areas clearly bounded by a strong security fence. Even after obtaining these measures, a community may insist on strict institutional controls for the entire site. Communities will seek decontamination and land use controls, not necessarily so the site can be

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[1] Draft NCP, p. 143.

developed to its highest use, but more likely to ensure that surrounding properties can be developed.

Town officials and activists, already aroused by rapid development, will seek an active role in Superfund. Their involvement is an important factor in public acceptance of future site use, and may even ease EPA's work at most sites. Citizen advisory committees, like those at Nyanza and Re-Solve, have helped EPA achieve far better community relations than at controversial sites where CACs haven't existed. CACs should be institutionalized by the Agency as part of the RI/FS process. CACs are particularly important where residential development pressures make land use issues an important factor in risk assessment and cleanup levels.

Citizen advisory committees are not, of course, perfect solutions for EPA's community relations problems. Yet such organizations could help ease many difficulties. A site manager in Missouri told me of his experiences working with rural communities there. One significant problem, he noted, is that Agency representatives are urban outsiders. He said there is physical separation between Agency reps in suits and townfolk; the feeling of "us vs. them" comes through even in the most amicable of meetings. In addition, EPA is the accessible target since, in contrast to the PRPs, EPA invites comments and criticisms. A local representative body would reduce EPA's isolation. The Agency needs a community to feel at least partially responsible for a cleanup decision. EPA may be forced to occasionally make an unpopular decision, but a CAC would reduce this problem.

EPA may find it useful to give the CAC control of the site for post-remediation land use decisions.[1] Giving control to the community, while possibly creating some problems, will help end the sociological and psychological problems described in the second section of this paper. Overcoming those problems could be the key to redevelopment of a Superfund site after EPA leaves the area. If insufficient public interest exists for a CAC, or the CAC does not wish to control the use of the site, then EPA could institute necessary control.

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[1]The CAC could be set up as a quasi-government corporation, or whatever legal status is necessary to gain control over the use of the site without facing the liabiltiy for any remaining contaminants.

Few Superfund sites exist in densely populated areas; those that do--like Chemical Control Corporation in Elizabeth, New Jersey--are in industrial zones that have long-standing reputations of endangering human health and the environment. Cleanup strategies are best undertaken with the entire zone as a target. This will be a very long and expensive process, but can be done as part of land use planning to involve the community in cleanup decisions. Individual sites need to be cleaned to below background levels in order to begin decontamination of the industrial zone. It is very unlikely, however, that communities will use Superfund sites in badly contaminated industrial zones for any use other than heavy industries or for parking lots.

Communities appear to accept isolation of wastes, instead of decontamination, at sites located in industrial zones. Industrial areas are generally accepted as sources of pollution; zoning invariably places industry in marginal areas far from residences. In undeveloped locations industries may own huge tracts of property, effectively isolating toxics from neighboring areas. As long as human health or important resources are not endangered, industrial pollution is perceived as somewhat inevitable. Re-use of contaminated industrial sites is more acceptable than development of Superfund sites in residential areas. Where a threat is perceived, however, as in Woburn, communities will insist on an active role in remediation and land use decisions. In such cases EPA should, as in residential areas, set up a CAC empowered to control post-remediation use of the site.

If law or regulations do not allow a CAC to control site use, then EPA should specify in the ROD precisely what kind of institutional controls will be used in remediation. In particular, if land use restrictions are part of EPA's plan, the ROD should state what restrictions will be imposed. Residents are often concerned that owners of the property may try to avoid responsibility for cleaning up the site, and then sell the property after EPA and the state complete the cleanup. Aside from the moral issue of making a profit based on work taxpayers paid for, the community is worried that the owner will sell or use the land for an irresponsible use. This is an important issue at the Picillo Farm site, as well as at McKin in Maine.

Other actions by EPA during the Superfund process could ease community relations and facilitate consideration of post-remediation use of a site. Sites ought to be fenced immediately after the preliminary assessment indicates the general area(s) of contamination. Barriers can provide

important psychological protection for people living in the surrounding area, as shown by the generally low-key reaction to secluded industrial sites. Fences should be authorized under emergency action regulations and not await remediation of the site.

Finally, EPA should be aware that the fear of air pollution from hazardous waste incineration is widespread. Ms. Maclennon at Lowry addressed this problem, and similar fears were expressed by respondents at other sites. Martha Bailey in New Hampshire voiced considerable anger when a visitor to Ottati and Goss reported air monitors were not operating. Fear of incineration may die down as a favorable record of the technology is established, but this community reaction must be anticipated by the Agency. Anticipated air pollution is, of course, an effect of a cleanup level upon the surrounding community, and anxiety about that remediation method could worsen a neighborhood's perception of the site.

The Congressional Office of Technology Assessment recently criticized EPA for failing to directly address the issue of post-remediation use of the Superfund site. "Most RODS seem uncertain about or do not address future land and water use in judging whether a selected remedy will be safe and permanent. In some cases, there is a lot of interest in reusing the land for productive purposes...Any remedy that leaves hazardous waste in place or caps it suggests the need for explicit attention to future land and perhaps groundwater use."[1] The process of risk assessment implies that post-remediation land use is considered by EPA. EPA should make land use, both of the site and of the surrounding area, an explicit part of the RI/FS process.

Post-remediation land use cannot be made an objective standard by which to develop cleanup plans. No accepted objective standard exists to determine, for example, whether a community is a small town, undeveloped, rural residential, or under development pressures. The past, present, and expected use of a Superfund site and surrounding properties, however, certainly influences public perceptions of EPA's cleanup decision.

EPA could follow the Massachusetts Contingency Plan (MCP, 310 CMR). The first report DEQE files about a site, the "Preliminary Assessment Report", identifies property present, property past, and the surrounding area as industrial, commercial, residential, agricultural, or undeveloped. This

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[1]OTA, "Cleaning Up?," p. 14.

"characterization of past and present land use nearby the location" becomes part of the Phase I - Limited Site Investigation (310 CMR 40.543). Phase II, the Comprehensive Site Assessment (40.545), demands "identification of existing and reasonably foreseeable land uses" at the site; a judgement withheld from EPA RODs. DEQE is required to evaluate each remedial response alternative in light of "reasonably foreseeable land uses at and nearby the disposal site." (40.546) This information is important to all interested parties, particularly the neighboring community.

Communities do seem to respond differently to Superfund sites in industrial areas than they do to sites in residential zones. EPA should therefore consider making post-remediation site use part of selecting a cleanup level. The risk-assessment process already appears to be based upon land use. Explicit consideration of post-remediation land use can have two effects. A community may be reassured by this information, particularly if EPA supports an acceptable decision with a detailed plan of legal and physical land use controls. If, on the other hand, residents object to the cleanup level chosen by EPA, land use issues could become the basis for either seeking a compromise, or providing additional measures that satisfy community concerns. Superfund community relations would also be improved by instituting citizens' advisory committees with the power to control use of the sites after cleanup.